WETLAND TREATMENT SYSTEM FEASIBILITY STUDY

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INTRODUCTION

Enhanced ecological awareness in the last decade has led to expanded governmental regulation of society's discarded wastes. In 1989, the Georgia Department of Natural Resources, Environmental Protection Division (EPD) imposed a mandate for no increase in organic wastewater loading to the Savannah River from current and future point source discharges. This has initiated the necessity for implementing new and innovative technology in all areas of waste management. Concurrently, the U. S. Army Corps of Engineers began exercising its jurisdictional authority under Section 404 of the Clean Water Act to regulate all dredge and fill activity within a wetland area. Approximately 70% of the undeveloped area in Chatham County falls into this category. These environmental issues which are impacting growth in the Savannah Metropolitan Community have prompted a study as to the feasibility of using wetlands as a means of advanced wastewater treatment. Significant benefits could be realized through the use of a wetlands treatment system by restoring disturbed wetland areas and/or by achieving an effluent water quality that has no statistical difference to the natural quality of the receiving stream.

The Travis Field district of Chatham County has been targeted as a potential growth area. This tract, which covers the north and western parts of the County, is relatively undeveloped with an industrial park and a new access highway (Jimmy DeLoach Parkway) in the design stages. The wastewater treatment facility (WWTF) which services this area is currently at its design load capacity, thus, necessitating rehabilitation. The Wastewater Plan calls for an increase in the facility's capacity to 3 MGD. The recently imposed restriction on wastewater loadings to the river will require the WWTF to increase the quality of its discharge by three fold from 30 mg/1 to 10 mg/1 BOD_5. The potential for growth and the necessity of upgrading wastewater treatment requirements make Travis Field service district an attractive area for a wetlands treatment system.

METHOD

A 45,000 acre tract of land was delineated from the areas of interest. A preliminary survey of this tract was completed using a "fatal flaw" analysis identifying the following:

- whether the 45,000 acres contained several tracts large enough (500-3,000 acres in size) to provide desired treatment levels;
- the ratio of wetlands to uplands on the proposed site;
- the composition and structure of available receiving wetlands;
- the potential for state and/or federally listed plant and animal species to occur on site, which would be affected by increased nutrient loadings in receiving waters;
- existing site land uses and the impact of construction of a wetlands treatment system; and
- local, state and federal permitting requirements relative to the proposed sites and difficulty in obtaining permit.

The survey involved a literature search, ground truthing gathered documentation and entering the pertinent data into a geographic information system (GIS). Sources of data included U. S. G. S. topographic quadrangles, Soil Conservation Service maps and hydraulic data, U.S.Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps, available aerial photography, Federal Emergency Management Agency (FEMA) maps, county tax maps, and Georgia Department of Natural Resources (GDNR) species maps. Literature on potential listed species was collected from the U.S. Army Corps of Engineers (COE), the USFW, and the GDNR. Following this portion of the "fatal flaw" analysis, a brief site survey was conducted in order to verify this documentation and to assess site conditions. The GIS was used in the collection, management, and analysis of the different parameters obtained from the literature and the ground truthing of the 45,000 acre study area. Maps were constructed overlaying the information and three potential sites were identified. Figure 1 illustrates the study area boundary and the location of the three potential wetlands treatment system sites.

Additional evaluation of these locations was conducted in terms of water quality, hydrology, endangered species, existing wetlands and potential regulatory constraints. Table 1 summarizes some of the information collected in the study.

Table 2 lists endangered species that have the potential of occurring within the study boundary. None of the three

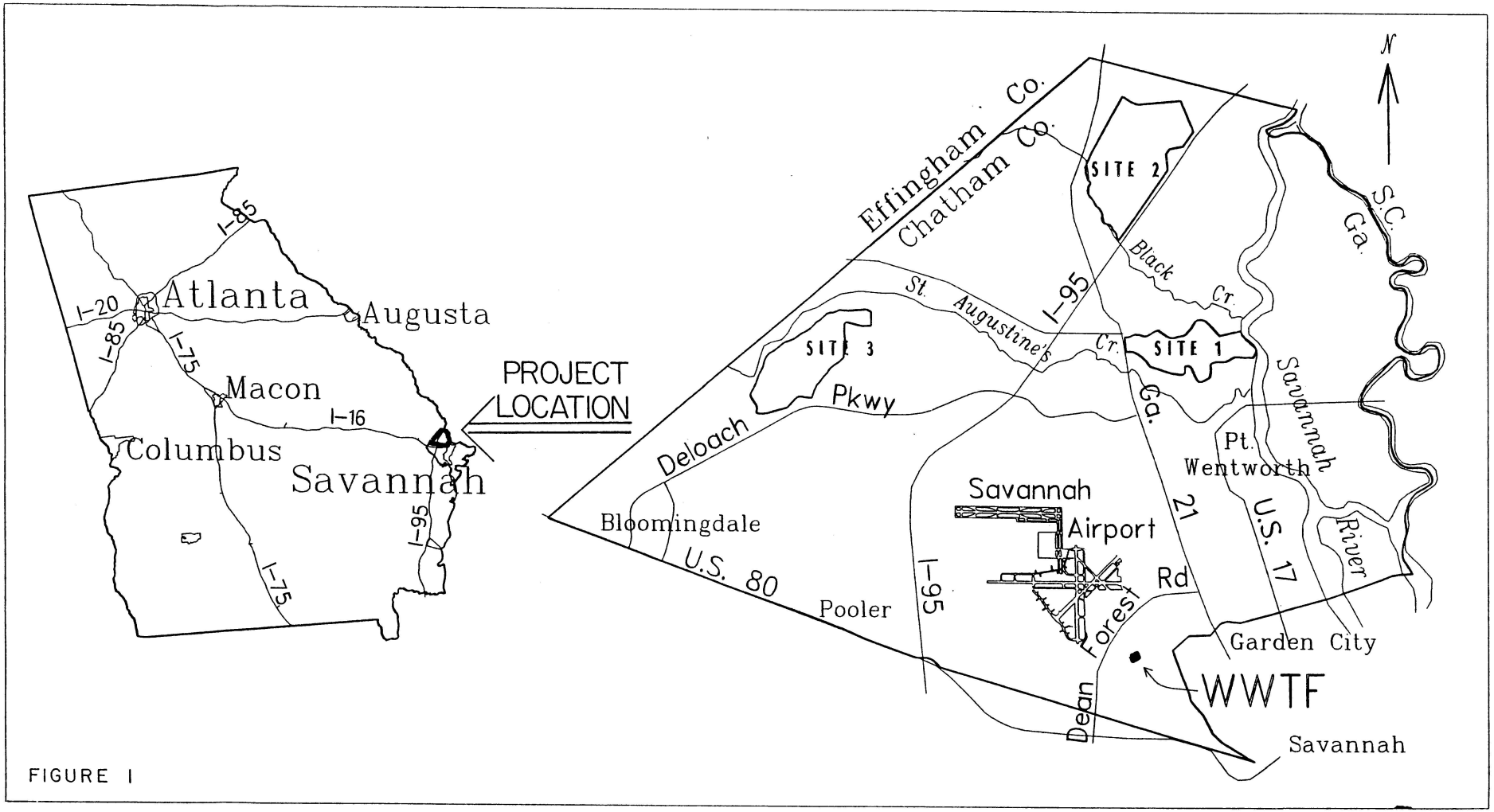
I-85
Atlanta
Augusta
I-20
I-85
I-75
Macon
I-16
Columbus
Savannah
I-75
I-95
PROJECT LOCATION
Effingham Co.
Chatham Co.
SITE 2
Black Cr.
S.C.
Ga.
St. Augustine's Cr.
I-95
SITE 3
SITE 1
Savannah
Deloach
Pkwy
Ga.
Pt. Wentworth
Savannah Airport
21
U.S. 17
River
Bloomingdale
U.S. 80
Pooler
I-95
Rd
Forest
Garden City
WWTF
Dean
Savannah
N

FIGURE 1

TABLE 1

SITE DELINEATIONS ANALYSIS

PARAMETER	SITE 1	SITE 2	SITE 3
SOILS	48% HYDRIC	76% HYDRIC	42% HYDRIC
WETLANDS	40%	70%	70%
RECEIVING WATERS	SAVANNAH RIVER	BLACK CREEK	ST. AUGUSTINE CREEK
FLOOD PLAIN	47% 100 YR PLAIN	29% 100 YR PLAIN	0% 100 YR PLAIN
CRITICAL HABITAT	ADJACENT REFUGE	WETLANDS	WETLANDS
LAND USE	FIELDS AND FOREST	SILVICULTURE AGRICULTURE	SILVICULTURE AGRICULTURE
TOPOGRAPHY	GRADE 0.2-3%	GRADE 0.2-2%	GRADE 0.03-1.5%
EXPANSION POTENTIAL	RESTRICTED	MODERATE	HIGH

TABLE 2

POTENTIAL THREATENED AND ENDANGERED SPECIES
CHATHAM COUNTY, GEORGIA

	SPECIES NAME	HABITAT
BIRDS	Bald Eagle (Haliaeetus leucocephalus)	wet prairies, marshes
	Black-necked Stilt (Himantopus mexicanus)	wet prairies, marshes
	Wood Stock (Mycteria americana)	salt and fresh marshes, cypress
REPTILES	Eastern Indigo Snake (Drymarchon corais couperi)	pine flatwoods, oak stands
FISH	Sea Lamprey (Petromyzon marinus)	open sea, estuaries, streams
	Tidewater Silverside (Menidia beryllina)	coastal and fresh streams
PLANTS	Hooded Pitcher Plant (Sarracenia minor)	bogs, wet ditches, savannahs
	False Dragon-head (Physostegia veroniciformis)	river swamps and sloughs

proposed sites provide significant amounts of potential habitat for the listed species.

CONCLUSIONS

Wetlands have proven to be effective treatment systems for the removal of nitrogen, phosphorus, BOD and TSS from domestic wastewater discharges. A wetlands community structure is well suited for the removal of large quantities of nitrogen through the nitrification/dentrification process (Gersberg et al., 1983). Oxygen consuming constituents such as NH_3 can be rapidly consumed or converted to NO_x forms within the wetlands system. Wetlands have a lesser capacity to remove phosphorus (Boyt et al., 1977), but a balanced design that facilitates the uptake of phosphorus at the WWTF and the wetlands can produce an effluent quality that is at or better than background quality of its receiving stream.

Wetlands have inherent uptake rates that can be enhanced and/or exploited by the inclusion of an internal water management plan within the design (Swindell, 1990). This allows the system to be operated such that the targeted wetlands community is protected from excessive exported nutrients. The overall result of designing an intensive internal management plan is to minimize problems such as the occurrence of mosquitoes, excessive odors, and the occurrence of nuisance or weedy vegetation within the system that could potentially spread to other wetlands areas outside the boundaries of the project. The proposed Travis Field wetlands system will be designed as a long term cost effective disposal option for western Chatham County's domestic and industrial treated wastewater discharges. The wetlands design will allow the creation of a multi-purpose system that will take advantage of wetlands communities to remove nutrients to background level (no discharge system), expand wildlife habitat, restore disturbed wetlands, stabilize hydrology and increase diversity to the adjacent wetlands systems.

RECOMMENDATIONS

The preliminary feasibility study indicated that a wetlands treatment system is a viable option for meeting Chatham County's future area wastewater treatment requirements. It was recommended that the system be implemented on Site 3. Listed below are the initial steps recommended to proceed:

1. Complete a data collection and water quality survey of receiving waters, where necessary, including the Savannah River and its surrounding tributaries.
2. Complete a detailed soil survey for determining soil characteristics such as grain size, chemical analysis, determination of stratification for confining layers close to the surface, and depth to water table.
3. Complete a detailed survey for endangered species and vegetation.
4. Complete general topo and receiving channel morphology to insure existing conditions have the hydraulic capacity for the wetlands effluent.
5. Complete design development engineering report and Section 404 wetlands permit applications.
6. Complete plans, specifications and contract documents in accordance with wetlands permit.

LITERATURE CITED

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